Methodology for baseline study - Project: Productivity and occupational health and safety in the garment industry in Bangladesh (POHS-BD)

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Productivity and occupational health and safety in the garment industry in Bangladesh (POHS-BD)

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Contents

1 Introduction

The project aims to create knowledge regarding sustainable co-development between productivity and occupational health and safety (OHS) in the readymade garment (RMG) industry in Bangladesh. As such, this project aims to directly and indirectly improve productivity and OHS practices among Bangladeshi companies. The companies are considered motivated to implement OHS improvements as they simultaneously experience productivity gains. OHS is thereby transformed from being a cost to becoming a means for productivity growth.

The aim of the baseline study is to gain knowledge of the present level of productivity and OHS maturity of the RMG firms, their development needs and their experience with integrating productivity and OHS as well as relations with the external buyers. The capability maturity for productivity is based on continuous improvement maturity assessment and Gartner's capability model from the extant continuous improvement and lean literatures (Womack, Jones and Roos, 1990; Womack and Jones, 2003; Melenovsky and Sinur, 2006; Bessant and Francis, 1999). The maturity assessment encompasses both technical and organizational/behavioural dimensions with special attention to institutionalizing practices. The model allows organizations to identify their current level of maturity and devise the actions needed to progress to the next maturity level. It is here applied by the researchers. The model consists of five levels ranging from ad hoc application of productive practices over codification and embedding of practices to systematic continuous improvement of practices. The organizational health and safety maturity assessment is based on the extant safety literature (Parker, Lawrie and Hudson, 2006; Dejoy, 2005). Parker et al.'s model has been used to describe the safety maturity related to culture and management system in many industries including oil, aviation and healthcare. Hudson's model illustrates a five step progression from a "pathological" stage where there is a "no care" culture and "no systems" through to a "generative" stage where managing risks is a way of life and fully integrated systems are effectively in place.

The baseline study is conducted in 50 RMG firms constituting large, medium and small firms. The firms are identified through the so-called snowball technique from industry stakeholders (i.e. BGMEA, BKMEA) and from AUST University in Bangladesh. The learning from the baseline study is used to identify areas for improvement which will feed the next step of the study. The next step aims to intervene in 12 companies in order to elevate the current maturity level of the 12 companies

to at least one level above. This step also entails devising a tool to identify sub-optimal situations in practice. The interventions are designed in detail for each maturity level.

2 Design

When looking at an organization and its activities, three main components can be identified: 'structure', 'processes', and 'culture' (Antonsen, 2009; Guldenmund, 2010). Organisational structure is about the formal aspects of an organization. It is not only about the infrastructure and hardware, but also about the distribution of tasks, roles and responsibilities, control, and authority (power). Structure thus determines how the organizational mission should be achieved, and by whom (Guldenmund, 2010, p. 85).

Organisational processes refer to the core business and supporting processes in an organization. These also comprise management processes and systems, as well as the social/interactional processes i.e. everything that relates to social relationships, communication, and exchange of information between the workers in an organization. These interactional aspects can be seen in features like cooperation, trust, competition, or conflict (Antonsen, 2009, p. 45).

Organisational culture, or corporate culture, applies more to the informal aspects of work and organising. It is about what people in an organization value as important, and about their underlying common beliefs and convictions. Organisational culture is often described as "the way we do things around here" (Guldenmund, 2010, p. 21). There is not just one overall culture within an organization. Several (sub) cultures can co-exist, typically linked with different units, departments, hierarchical layers, and occupations. These cultures within an organization are not isolated but are obviously affected by the national culture, and specific characteristics from a country, region, sector, industry, or occupation (Antonsen, 2009).

In order to analyse and better understand OSH and Productivity within an organization, the organizational triangle model (structure, processes, culture) and the interrelated perspectives of the three organizational dimensions are taken into consideration. Take, for example, an industrial company, one of whose employees has experienced a serious accident. The investigation following the accident reveals that some minor incidents preceded this accident. These 'near-misses' were, however, not reported to the line management, and did not lead to any appropriate measures that could have reduced the risk of the accident happening. From the processes perspective, it could be argued that there was a lack of communication on safety issues. Poor communications on safety issues could also be related

to structural factors in organizations e.g. because line managers, supervisors, and/or workers are not aware of their specific role and responsibilities related to safety. The problem could also lie in the "softer", cultural aspects of the organization. Working safely and preventing accidents may not form part of the company's value system, leading to an atmosphere of non-compliance with good operating practices, poor safety communication and failure to take effective action to remedy safety and health problems.

As for the assessment of an organization maturity levels for OSH and Productivity, it is important to note that while structures and processes involve concrete elements, culture involves abstract elements related to attitudes and behaviours. These abstract and soft elements pose extra challenges for the assessment of both OHS and productivity maturity. In order to capture these complexities associated with culture assessment, scholars have recommended the combination of different and reinforcing approaches. For instance, Guldenmund (2010, pp. 183 ff., p. 197) distinguishes respectively the analytic (psychological), the pragmatic, and the academic (anthropological) approach to the study of occupational safety culture (Table 1). In this baseline study, we rely on the academic and pragmatic approaches for assessing the maturity levels of safety and productivity of the companies.

Table 1: The analytic, academic and pragmatic approach towards safety culture

Main approach	Time focus	Information aimed to retrieve	Research characteristics	Assessment strategy and methods
Academic (anthropological)	Past	Qualitative information	Descriptive	Fieldwork, ethnographical-inspired methods (e.g. document analysis, observations, focus groups, interviews, etc.)
Analytical (psychological)	Present	Quantitative information, on the safety climate	Descriptive	Safety climate scales, questionnaires
Pragmatic (experience based)	Future	Safety culture maturity (level)	Normative, prescriptive	Behaviourally Anchored Rating Scales

Source: based on Guldenmund (2010, pp. 183 ff., p. 197).

3 Development of methodology

3.1 Selection of relevant maturity models

Assessment tools are critical to the success of continuous improvement of productivity and OHS — or in the successful implementation of any world class manufacturing principles for that matter. Assessment tools have many functions, most important perhaps as a "roadmap" that illustrates the company's current status among its most important performance parameters. A good assessment is also invaluable in identifying opportunities for improvement and the parameters in which action plans should be designed. For an assessment tool to fulfil these functions, it must accurately reflect the nature and complexity of what is being assessed.

In this study, the development of the methodology started with a review of the maturity assessment models related to OHS and lean/continuous improvement available in the extant literature (Hudson, 2001 & 2003; Bessant et al., 2001; Jorgensen et al., 2007). It was not possible to identify one model that fits perfectly the needs of this project. Based on this, we have drawn upon existing maturity assessment models for safety and lean/continuous improvement. In addition, stakeholders in the garment industry in Bangladesh have been interviewed as well as selected garment companies visited. The models of this study were built with more focus on the concrete elements and less emphasis on the abstract elements of the organizations which is considered more suitable for organizations with varying levels of OHS and productivity maturity - as it is the case in Bangladesh RMG industry.

3.2 The Occupational Health and Safety Maturity Model

The models of maturity assessment available in the extant literature focus on the assessment of the traditional safety culture, but lack the dimensions for health assessment dimensions. One famous model is depicted in Figure 1, which illustrates a five step progression from a “reactive” stage where there is a “no care” culture and “no systems” through to a “generative” stage where managing risks is a way of life and fully integrated systems are effectively in place. This model is strongly inspired by the five- stage model of Hudson and colleagues (Hudson, 2001; Hudson, 2003; Parker et al., 2006). Since our research interest is to investigate both health and safety maturity, we have built on this model by adding the health features for each stage of maturity.

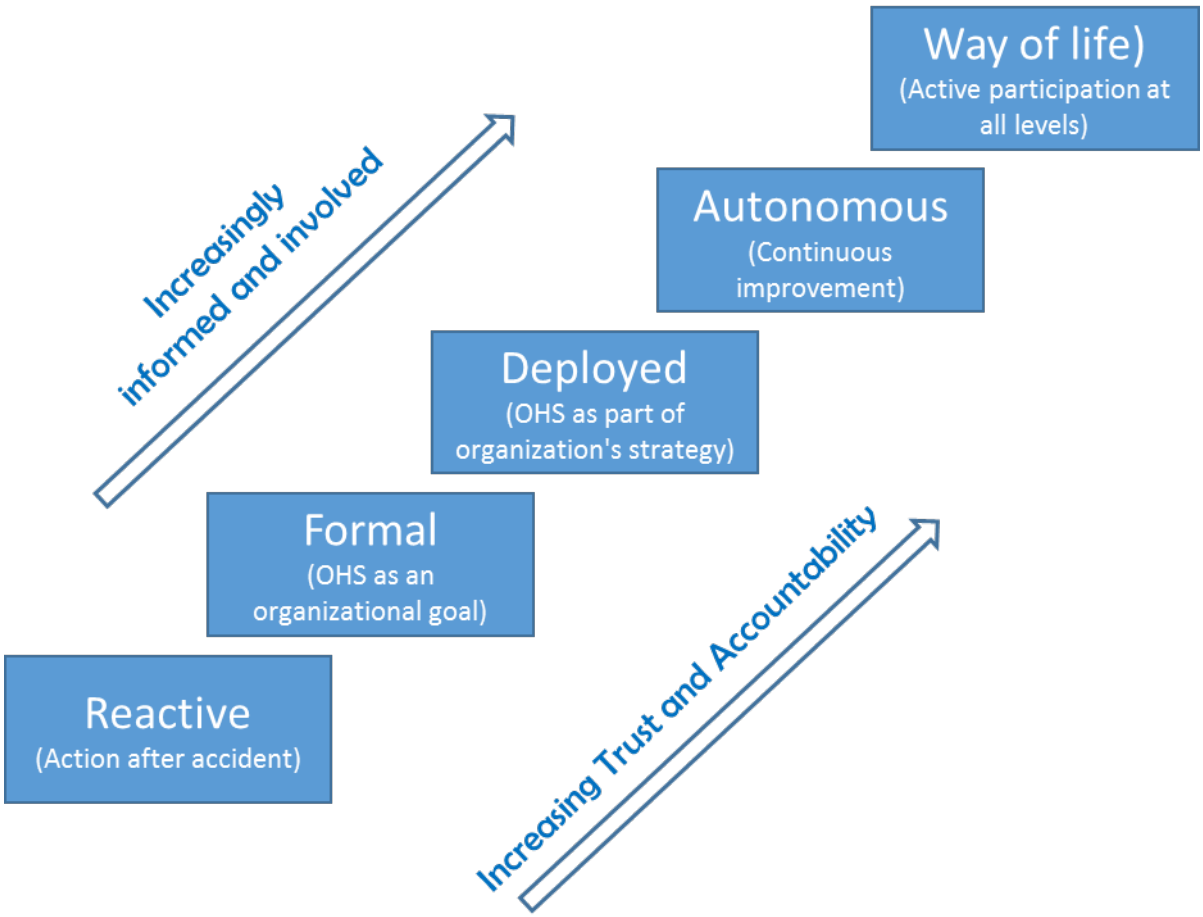

Figure 1. The Health and Safety Maturity model

The descriptions of each stage of OHS maturity model are given below.

Reactive:

Organizations act only action after incidents. At this stage an organization sees OHS as an external requirement, and not as an aspect of conduct that will allow it to succeed. The external requirements are those of government, the legal framework and the regulatory bodies. There is no awareness of the behavioral and attitudinal aspects of OHS. OHS is seen as a technical issue, to be achieved by compliance with rules and regulations.

Some characteristics of an organization in this stage are:

(1) Problems are not anticipated, and the organization reacts to each one as it occurs.
(2) Communication between departments and functions is poor.
(3) Collaboration and shared decision-making is limited.
(4) People who make mistakes are blamed for their failure to comply with the rules.
(5) There is not much listening or learning inside or outside the organization, which generally adopts a defensive position when criticized.

Formal:

An organization at this stage considers OHS to be an organizational goal, even in the absence of external requirements. Strategy and mechanisms for compliance are in place with little impact on daily operations. OHS involves some collection of data. OHS is still primarily driven by management and imposed rather than looked for by the workforce. Although there is growing awareness of behavioral issues, this aspect is largely missing from OHS management, which generally concentrates on technical and procedural solutions.

Some characteristics of an organization in this stage are:
(1) Strategy and practices for OHS improvement have been introduced to the company with yet little effect on daily operations
(2) Management's response to mistakes is to introduce more controls and procedures, and to provide more retraining.
(3) The relationship between employees and management is adversarial, although there may be more opportunities to discuss common goals.
(4) The organization remains reactive in relation to problems, although there may be more anticipation of potential problems in planning.

Deployed:

The implementation of the OHS compliance is now a part of the organization's strategy and projects and activities are planned on the basis of established goals and objectives. Knowledge of and practical

experience with improving OHS are acknowledged and recognized in the organization, although initiatives are still focusing on pressing issues. Satisfactory performance improvements are achieved. Specific HR systems (i.e. selection, compensation, training functions) are aligned with OHS compliance objectives. Some characteristics of this level are:

1. The role of management is to make sure that goals are achieved and that work objectives are clear to employees.
2. The organization is willing to learn from external groups, especially new techniques and best practices.
3. The interaction of people and technology is considered, but more from the viewpoint of increasing the efficiency of the technology.
4. There is more teamwork.
5. There is growing awareness of the impact of cultural issues in the workplace, although it is not understood why added controls and training have not yielded the expected safety improvements.
6. Management encourages interdepartmental and inter-functional communications.

Autonomous

Workforce involvement starts to move the initiative away from a purely top down approach; however top management still plays a role in leading the improvement of the health and safety management system. An organization in this stage has adopted the idea of continuous improvement and applied the concept to safety. There is a strong emphasis on communications, training, management style and improving efficiency and effectiveness. People within the organization understand the impact of cultural issues on OHS.

Some characteristics of an organization in this stage are:

1. Problems are anticipated and dealt with before they occur.
2. Collaboration between departments and functions is good.
3. There is no goal conflict between safety and production.
4. Almost all mistakes are viewed in terms of process variability with the emphasis placed on understanding what has happened, rather than finding someone to blame.

5. Learning from others, both inside and outside the organization, is valued.
6. People are respected and valued for their contribution.
7. The relationship between management and employees is mutually supportive.
8. People are aware of the impact of cultural issues, and these are considered in decision making.
9. People are rewarded for improving processes, as well as results.
10. People are considered to be an important part of organizational systems with attention given to satisfying their needs, and not just to achieve technical efficiency.

Way of life

This stage includes all the proactive stage features with active participation at all levels. Management's role is seen as coaching people to improve performance, rather than involving directly in safety issues. OHS is perceived to be an inherent part of the culture and the business. Organizations are characterized by chronic unease as a counter to complacency.

3.3 The Productivity Maturity Model

Based on the extant literature, a productivity assessment tool must address two perspectives or dimensions, each of which encompasses a number of variables. Specifically, the literature proposes that an assessment tool must include the following:

(1) A technical perspective, which reflects performance, methods, and tools in relationship to the given company's strategic "scope", as described by (Hines et al., 2004).

(2) An organizational perspective, which reflects management, organizational and human capabilities, culture, and learning.

Based on the literature review we identified maturity models related to continuous improvement/productivity (Bessant et al., 2001) and lean (Jorgensen et al., 2007). However, the continuous improvement/productivity models identified in the literature were more complete and covered more aspects of production and operations than the lean maturity models. Based on this, we combined both models to create our own which have features of both the continuous improvement/productivity and lean models. The maturity model of this study (Figure 2) is based on a 1-to-5 rating scale in order to assess the Productivity Maturity level, where stage 1 represents the lowest level of maturity and stage 5 is best in class.

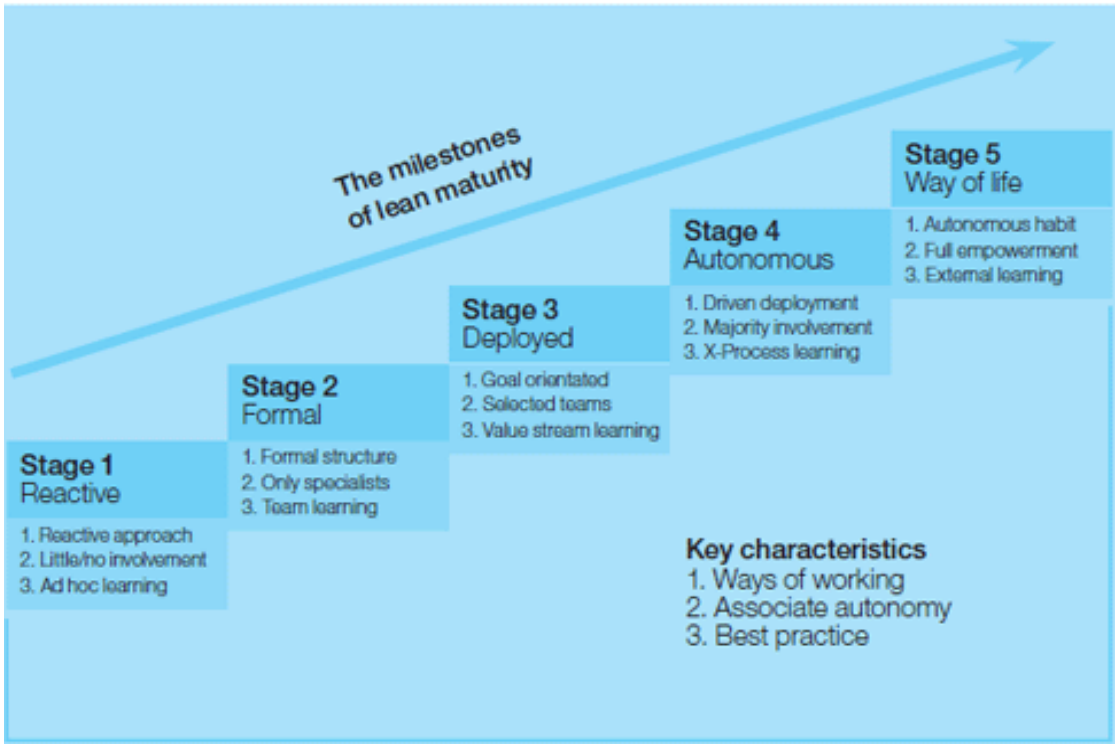

Figure 2: The Productivity Maturity Model

Stage 1: Reactive

This level is characterized by occasional rather random efforts at optimization in various organizational units, but these activities are not planned or implemented on the basis of an overall strategy or a specific manufacturing philosophy. The optimization projects are typically led by experts with little to no general employee involvement. Organizational mechanisms and systems are not integrated with the improvement philosophy and/or objectives. Some characteristics of this level are:

1. Problem-solving random and ad hoc oriented
2. No formal efforts or structure
3. Occasional bursts punctuated by inactivity and non-participation
4. Dominant mode of problem-solving is by specialists
5. Short-term benefits
6. No strategic impact

Stage 2: Formal

The company has now chosen the improvement strategy that will serve as the basis for production optimization. Experts are leading the initiative and some workers have received basic training. Pilot projects have been initiated in isolated units within the organization for the purpose of experimenting with improvement tools and methods. At this stage, initiatives happen as a result of learning curve effects associated with a particular process improvement projects and then fade out again. Improvement initiatives can also result from a short-term input - a training intervention, for example, - and leads to a small impact around those immediately concerned with it. These effects are often short-lived and much localized. Some characteristics of this level are:

1. Increased training of the workforce on improvement tools
2. Most projects done by experts with some participation of the workforce
3. Structure and strategy of the improvement are in place before the full deployment phase

Stage 3: Deployed

The implementation of the improvement initiative is now a part of the organization's strategy and projects and activities are planned on the basis of established goals and objectives. Knowledge of and practical experience with tools and methods as well as the manufacturing improvement are acknowledged and recognized at all levels of the organization, although initiatives are still primarily implemented according to an established plan. Satisfactory performance improvements are achieved. Specific HR systems (i.e. selection, compensation, training functions) are aligned with lean objectives to support improvement goals.

Some characteristics of this level are:

1. Formal attempts to create and sustain the improvement outcomes and practices
2. Use of a formal problem-solving process
3. Formal attempts to increase employees' participation
4. Training in basic Productivity/lean tools
5. Structured idea management system
6. Recognition system
7. Can extend to cross-functional work but on an ad hoc basis

Stage 4: Autonomous

Productivity/Lean activities occur continuously from all areas of the organization. The practical understanding of improvement tools and methods is quite high and these are used actively by all members of the organization to develop and implement performance improvements. All HR functions are aligned with improvement objectives for the purpose of supporting long term sustainability. Focus on, e.g. career development and extended developmental activities (e.g. external education). Management is still directly involved in sustaining lean in the organization. Some characteristics of lean at this stage:

1. All of the previous stage
2. Formal deployment of strategic goals
3. Monitoring and measurement of Productivity against these goals

Stage 5: Way of life

The improvement strategy is no longer just an internal strategy and its impact is visible in activities throughout the extended value chain level. Improvement activities are planned, implemented, and monitored across the extended boundaries. Knowledge sharing and knowledge transfer are important components of the activities across the extended boundaries and organizational structures support inter-organizational network building. The involvement of top management in sustaining Productivity/lean is much reduced. Some characteristics of Productivity/lean at this stage:

1. All of the previous stage
2. Responsibility for mechanisms, timing, etc., devolved to problem-solving unit
3. High levels of experimentation
4. Automatic capture and sharing of learning
5. Everyone actively involved in innovation process

3.4 Selection of companies

50 companies will be selected. The point of departure is advanced, medium and less advanced in terms of production capacity level and OHS level. Size is used as a proxy for the level. The companies

will be stratified on three size groups according to number of employees and number of production sites:

- Big companies with multiple production sites (above 2000 employees)
- Medium companies with one or a few sites (from 500 to 2000 employees)
- Small companies with one site (below 500 employees)

Candidates are contacted by telephone in order of priority and asked to join and the first introductory meeting is organised. Blind contact is avoided as it is not effective in Bangladesh. As consequence, persons from the companies, who are already known to the research team through personal or professional contacts, are the main contacts.

3.5 Expert testing

The questionnaire of the baseline study has been reviewed by experts from Bangladesh and from Denmark. The experts from Bangladesh have focused on the operational applicability of the questionnaire and adjust according the Bangladeshi context. These are operations managers or professionals from international or local work associations related to the RMG industry in Bangladesh. The experts from Denmark have focused on the research method (assessment model, scoring, type of questions, validity and reliability issues). The methodology has been adjusted according to experts' comments.

3.6 Pilot testing

Two companies from the RMG industry in Bangladesh have been used for the pilot testing of the questionnaire. The two companies have different sizes: one is big and the other is small/medium.
The pilot testing was used to test the applicability of interview guides, observations forms and quantitative data sheets as well as the relevance of the items and scales. Pilot testing was carried out in August 2015. The two companies were promised to be anonymous.

3.7 Training of researchers

A training workshop was organized at AUST in August 2015 for the training of the researchers involved in the baseline study (Professors from AAU and AUST, PhD students, Research assistants).

The workshop included presentation of background for methodology, maturity models and data sampling methods. Data sampling, analysis and scoring were furthermore trained during pilot visits to two companies.

4 Data collection in companies

Data collection involves two to three visits to each company. The number of visits has to be kept down due to logistic and resources constraints.

4.1 Introductory visit

Purpose of the introductory visit(s) is to:

- secure the necessary social ties and consent from the company managers
- plan the subsequent data collection
- collect the first basic information about the company
- get an overview of the production set up

Participants from AUST: One senior researcher, one PhD student and one research assistant. It is expected to use half day in the company. The project has allocated funds to entertain the managers with a joint lunch.

The meeting should include:

- presentation of researchers
- presentation of project
- expectation towards the company
- the offer to give researcher feedback to company
- a promise of confidentiality
- collection of basic information
- a short tour round the company
- planning data collection

Before planning it is proposed to the manager to make a short round tour in the factory in order to get an overview of the production set up in the company. The planning of the data collection includes:

- agreement on date for next visit
- a list of interview persons
- a sequence for the data collection day
- a list of quantitative data to make available

- agreement about the selected part of the production process to carry out observations

The opportunity is used to collect general information about the company.

4.2 Main data collection

The main data collection is planned to take place as soon as possible after the introductory visits. It is expected to last for one full day, and the AUST participants are one senior researcher or one PhD student and one research assistant. The purpose is to collect the main bulk of information from the company. The data collection will cover the four types of evidence in Table 2.

Table 2: The four types of evidence

Evidence	
Data	
Documenta-tion	
Informants	
Observation	

1. Data cover the numerical measurements and indicators of productivity and OHS.

2. Documentation covers quantitative number on production and OHS, minutes of meetings, written policies and norms, projects and programmes description and procedures etc…

3. Informants - This category represents all information obtained from the semi-structured interviews and focus groups with employees and managers. People that can be interviewed include Production managers, Safety managers, HR managers, Sales managers, Production Supervisors, workers (participation committee member and/or union representatives). The interviews with the various informants will be partly overlapping. If information is collected from one informant, then it can be checked from another informant as part of triangulation. If information is simple and no reason to doubt, repetition of questions can be skipped.

4. Observation - This is the visual evidence observed by researcher during the observation tour, such as the design of the process flow in the shop-floor, visual cards with different colours indicating the safety levels, level of risk control, kanban, etc…

All four types of evidence are not available for all dimensions. Rather some dimensions might rely heavily on data, while others could depend on interviews and observations. As such, the researcher will have a list of the types of evidence needed for each dimension and use this list as guide for collecting evidence during the full day visit. The day is completed by a winding up meeting with management which includes feedback to management and making agreement about acquisition of missing information (especially quantitative data).

4.3 Follow up visit

Purpose is to collect missing information and give feedback to management. As far as possible a follow up visit is avoided to save resources but only in case that all necessary data

Participants: Senior researcher + PhD student + research assistant

5 Data analysis and report writing

5.1 Writing detailed summaries of all interviews and observations

To be carried out by research assistant in consultation with PhD student. The template for interview summaries is used. Summaries are as detailed as possible and include both questions and answers. No assessment, only data as spoken by interview persons.

5.2 Data entry of all quantitative data in spread sheet

All quantitative data including basic information and score sheets from observations is keyed in to a spread sheet. To be carried out by research assistant in consultation with PhD student

5.3 Scoring of all scales and maturity level

The stage of development of productivity and OHS maturity in an organization is assessed using the following method. Each of the dimensions is viewed in a different way in each of the five stages of development of maturity. The approach is to consider which stage is most reflective of the factor being considered. When this is done for all the dimensions, it will generally be found that one specific stage has been selected more than the others. The stage with the majority of selections is considered to be the stage to which the organization, under consideration, has developed its safety maturity.

5.3.1 Aggregate assessment example

For each of the dimensions, select the stage that most reflects the organization. The aggregate assessment of the company is the average of the individual scores of all dimensions. As such, each company will have 2 aggregate scores: one score for OHS and one for Productivity.

5.4 Writing a narrative report

Approximately 10 pages + appendices with interview summaries, basic information forms, quantitative data, and observation form and scales (Phd-student and Research assistants).

5.5 Validity, Reliability and Quality Control

The validity and reliability of the research are secured through the determination of guidelines for the conduction of the empirical analysis and its outcomes. The guidelines are:

1. Two researchers participate in each visit.
2. All researchers have been trained in the methodology and scoring and observations aligned.
3. The researchers archive all the original data
4. The analysis of data (interpretation and conclusions) is done by at least two researchers
5. In case of disagreements between the two researchers, a third senior researcher makes a third assessment for solving the disagreement
6. A senior is making quality control assisted by a checklist securing that all data is collected, interviews and data keyed in and report has the expected quality level.

Appendices

Appendix 1: Basic company information

The basic information of the companies is presented in the following tables.

Date	
Responsible researcher	
Other researchers	

Company information (if possible fill out before visit)

Name of company	
Ownership	
EPZ/Ownership	
Headquarter address	
Webpage	
Foundation	
Number of production sites	
% export	
Production capacity (Maximum number of units produced in one shift under normal conditions of machines and workers)	

Production site

Name	
Address	
General manager (name, email, tel)	

Departments/structure	How many departments/units and the name of each department/unit
Description of facilities (buildings, area, stories)	
Production capacity (Maximum number of units produced in one shift under normal conditions of machines and workers))	
Main costumers	
% utilization of capacity	
Certificates	
Membership of business associations	
Unions/committees	

Main products of the site (no of pieces)	Last Year	Current year + projection
Comments		

Employees of the site	Last year	Current year + projection
Total (incl. all categories)		
- male		
- female		
Shop floor workers (production)		
Managers and production staff		
HR and safety staff		
Quality assurance staff		
Comments		

Accidents	Last year	Current year + projection
Total no. of accidents		
Comments		

Turnover and absenteeism	Last year	Current year + projection
Turnover in % (annually)		
Absenteeism in % (annually including with and without leave)		
Comments		

Productivity	Last year	Current year + projection
Standard main product		
Units/minutes (SMV)		
Units/worker/hour		
Comments	Standard product is the basic product (Basic shirt, Basic T-shirt and Basic pants). SMV is Standard Minute Value.	

Quality	Last year	Current year + projection
Employees		
% of products with quality defects		
% of Remaking (Total defects less Rejected)		
% no of products scrapped or rejected by quality control		
Acceptance quality limit (AQL)		
Comments		

Salaries and working hours for shop floor workers	
Lowest salary	
highest salary	
Average salary	
Normal working hours daily	
Average number of overtime hours daily	
Number of shifts	

Appendix 2: Interview guides and templates

For each dimension under assessment, there are four types of evidence. The following two sheets contain a summary of all dimensions (for both OHS and lean/productivity) and the types of evidence needed to fully assess each dimension. Based on these two sheets, the researcher can plan his working day by identifying the type of information and the instruments needed in order to access the dimensions.

Dimension	Evidence			
	Data	Documentation	Informants	Observation
	The OHS Maturity Assessment			
Leadership commitment and communication	X	X	X	X
Business Policy	X	X	X	
Relation with contractors	X	X		
Relation with buyers	X	X	X	
Objectives, Targets & Performance Measurement	X	X	X	X
Training	X	X	X	X
Workforce Involvement	X		X	X
OHS structure and accountability for OHS results	X	X	X	
Accident Investigation	X	X	X	
Unsafe Behaviors and Unsafe Work Conditions	X	X	X	
Legal requirements, Auditing and Reviews	X	X	X	
Industrial relations, Welfare and Job Satisfaction	X	X	X	X

Dimension	Evidence			
	Data	Documentation	Informants	Observation
	The Productivity Maturity Assessment			
Leadership commitment	X		X	
Employee involvement	X	X	X	
Training	X	X	X	
Continuous improvement	X	X	X	X
Value stream mapping	X	X	X	X
Control through Visibility	X	X	X	X
Accounting support to Productivity	X		X	
5S/housekeeping	X		X	X
Preventive maintenance	X	X		X
Structured Flow/Pull Manufacturing	X		X	X
Customers and Suppliers relationships	X	X	X	

Detailed notes are taken from all interviews. The research assistant either key in directly on the laptop or take handwritten notes which are keyed in immediately after the visit is completed. It is recommended that the researcher start the interview with open ended questions about the area or the dimension investigated. Then the researcher is encouraged to ask more focused close-ended questions in order to investigate deeper on one or more aspects of the answer of the interviewee.

Appendix 2.1 Interview checklists

The following tables contain the list of items that should be covered by the researcher during the interview according to the function and responsibilities of the interviewee.

Interview HR manager / Compliance manager / Safety manager				
Dimension	Evidence			
	Data	Documentation	Informants	Observation
	The OHS Maturity Assessment			
Leadership commitment and communication	The number of OHS programmes / Initiatives initiated and championed by top management / Number of health and safety projects initiated by employee suggestions	Descriptions of OHS improvement programmes (team composition, actions, outcomes) / Policy about dealing with employees involved in accident / Meeting minutes / memos of health and safety meetings where employees suggestions for health and safety improvement are noted and acted upon	What do you do after an accident? What happens to the employees involved in severe accident? What kind of safety communication do you use? Normally and after an accident?	
Business Policy	Type and number of awards / List of receivers of safety awards	Policy, Memo or minutes of meetings outlining the decision process and actions related to safety investments / Safety Award programme description (who is awarded? What is the criteria for awards?)	What types of investment in OHS has been done? What kind or recognition or rewards for safety do you have?	
Relation with contractors	The number of pre-qualified contractors / Total of contractors / Total of audits / Audits per contractor	Prequalification questionnaire for contractors / Training for contractors / Auditing process and resources/audits carried out and consequences taken	Do you have contractors? What kind of prequalification OHS criteria you look at?	
Relation with buyers	The number of direct and indirect buyers / Duration of relationship / Percentage of total revenues or sales per buyer / Total of audits / Audits per buyer	Prequalification questionnaire of buyers / Training by buyers / Auditing process (auditing items, penalties, corrective actions, resources)	Can you describe the relation with your main buyers?	

Objectives, Targets & Performance Measurement	Number of safety indicators (proactive and reactive / outcomes and process indicators) / Trends and charts of safety indicators	List of safety indicators and objectives / Owners of indicators / Process of monitoring and review	Do you have safety targets? What safety indicators and target do you have? Who is involved in establishing and improving safety targets?	Look for visual safety indicators in the workplace
Training	Number of trained employees and managers	Documentation for training (new employees, managers, safety professionals, office workers, shop floor workers)	What are the safety trainings you have? What is the aim of these training modules? How you identify needs for training?	Look at the quality and availability of health and safety training facilities and equipments
Workforce Involvement	Number of employees from each department engaged in safety initiatives (safety department, production, managers and workers)	Committees with worker participation (actions and outcomes) / Description of OHS work planning and the review process / Participants in the planning and review / Policy for risk analysis (participants / impacts on operations/ implemented risks assessments / List of items checked and description of the process of daily checks / participants / impacts on operations)	What the safety ongoing initiatives? Do you have OHS planning? Do you have safety committees? Do you have daily checks? How is it done?	Look at the software or other techniques used for risk analysis
OHS structure and accountability for OHS results	Number and seniority of people in the safety department / Turnover of OHS employees	Description of OHS responsibility in the company / Policy or minutes describing the accountability of managers and workers for OHS results and control.	What is the structure of safety? Who is responsible for following up on accident issues?	
Accident Investigation	Number of accidents investigated / Outcomes / Impacts	Description of the process for investigation of accidents (responsible for investigation and maintenance)	Do you have investigation process? Can you describe the process? Outcomes and follow up?	Look at the implementation and outcomes
Unsafe Behaviors and Unsafe Work Conditions	Number and types of unsafe behaviors and unsafe work conditions / Severity	Description of the process of reporting and improvement	What are the unsafe behaviors and unsafe work conditions? How do you report unsafe behavior and unsafe working conditions?	
Legal requirements, Auditing and Reviews	Number of critical and urgent issues in audit	Description of audit system / Latest regulatory assessment / Action plan	Please describe the auditing process and types	
Industrial relations, Welfare and Job Satisfaction	Number of employees using companies benefits / Type of benefits used	Description of the benefits policy	What are the benefits you have? How is the satisfaction with the benefits?	Look at the quality of the services (Medical Centre, Canteen, Childcare, Dormitories…)

Interview Production manager				
Dimension	Evidence			
	Data	Documentation	Informants	Observation
	The Productivity Maturity Assessment			
Leadership commitment	Number of full time lean employees or equivalent / Seniority level / Years of lean experience / Number of managers experts in lean/improvement	Projects and improvement documentation	What are the lean/improvement initiatives? Who participate in the projects? Who is the driver of the projects?	
Employee involvement	Number of improvement suggestions (Total / implemented/outcomes) / Number of employees participating in group projects	Description of the employees suggestions program / Documentation of group projects/teamwork and participants	Do you have an improvement process? Who is involved in improvement?	
Training	Number of trained employees (shop floor / staff / Managers) / Number of hours training by employee	Description of type of training available (basic, specialists, technical, behavioral)	What types of improvement training do you have? How do you identify the need for improvement training?	
Continuous improvement	Data showing number and type of errors / trends in errors / number of SOP	Description of problem solving methods based on use of data and performance indicators	Explain how you measure errors/defects and improve the process. Do you have SOP? How is SOP used? Who is involved in continuous improvement?	Look for SOP at the production line / Look for error proofing devices in the production line. Look for implemented improvements
Value stream mapping	Number of mapped value steam processes / outcomes	Maps and description of value stream processes	Do you use value stream mapping? How do you use VSM?	Look for the maps of value stream processes
Control through Visibility	Number of techniques/ Number of units using visual management techniques	Description of the objectives and implementation of visual management tools	Do you use visual management? What tools of visual management? How do you use the tools? What are the benefits?	Look for visual instruments in the shop floor and offices
Accounting support to Productivity	Accounting data supporting lean/improvement activities		Do you use accounting information for improvement?	
5S/housekeeping	Number of areas with 5S implemented and status of implementation	Description of 5S project	Do you use 5S? What are the status and the challenges of 5S?	Look at the 5S status on the shop floor and staff offices
Preventive maintenance	Number of employees trained in preventive management/data used for preventive maintenance	Preventive maintenance policy	Do you have preventive maintenance? How it works? Who does the preventive maintenance?	Look at the preventive maintenance schedules and devices at the shop floor
Structured Flow/Pull Manufacturing	Data about Takt time (= Production time available / Customer volume) / inventory level		Do you use flow or takt-time concepts? Do you use U shape or other shapes?	Look at the production line for inventories/Kanban/flow/U-shape/Cells/Pull

Customers and Suppliers relationships	Performance Indicators with suppliers and customers	X	What type of cooperation for production improvement do you have with your suppliers/customers? Are there sharing of experiences and risks?	

Quality manager	
Interview topics	
Structure and organization of quality control	Number of quality managers and supervisors, technical and admin involved
Quality management and control	Control items (size of the product, quality of the work)/ quality management by looking at wastes, reworks, rejections. (Measures like 3 sigma or 6 sigma; hypothesis testing such as t test or Chi square etc…; What is the process in case of rejections or defects? / Quality tools and techniques (form groups for investigation, look at numbers and statistics, use fishbone or PDCA)/ Error proof devices (if error above the acceptable limit, does the device shut the machine?)
Quality KPIs (Benchmark)	% of defects, time used for rework, value of scrapped products
Training in quality	Types of training (technical training like measurements or machine adjustments, tools like root cause analysis, use of numbers and statistics, understanding of variations and trends) / Number and level of trained employees (new employees, experienced quality controllers or inspectors, training for quality supervisors and managers)/ policy of training (automatic or according to needs)
Quality certifications	ISO 9001, others / what is the meaning of these certifications for the company? Is this for the buyers? Or workers involvement and motivations? Have these certifications impacted quality and productivity?
Suppliers	Quality control of supplies (what happens if the quality of supplies is not good?), indicators (on time delivery, quality of supplies, price of supplies versus quality), new products from suppliers
Buyers	management of customer demands (sampling, PP(pre-production), production; time and quality for the acceptance process), indicators (time and quality), customer audits, new techniques (sometimes buyers support or provide the technology)
Challenges and expectations	quality challenges (new customers or new styles), expectations and plans for future development of quality control and management / future certifications

Employees (focus group)	
Interview topics	
Experience with production and quality	Examples of production constraints and quality problems. Ideas for improvement
Experience with OHS and HR	Examples of OHS problems and HR problems (salaries, hours, benefits etc.). Ideas for improvement
Involvement in improvement of production and OHS	Examples of involvement, participation, process and outcomes, collaboration with supervisors
Training	Production, quality and OHS
Accidents	Examples of accidents, Investigation, follow up prevention and impact on workers
OHS policy practice	OHS checks / risk assessment / Reporting accidents / unsafe conditions / rewards
Benefits and services	Use / satisfaction

General manager of site	
Interview topics	
History	Main historical information about site and company
Growth (Investments / hiring)	Future or planned investments and hiring
Challenges	External and internal challenges
Strategic advantages	Competition / capabilities / Technology
Buyers	Relation and impact on business, collaboration (long term relationship, trust, commitment or shopping around)
Compliance	Compliance/OHS versus Productivity
Productivity or Lean	Tools and philosophy for increasing productivity
Employee satisfaction and turnover	Scores and actions

Appendix 2.2 Interview sheet

(To be copied, one for each interview)

The following sheet is the standard instrument used for writing the conversation during the interviews.

Date and duration of interview	
Responsible research	

Other participating researchers	
Interview person(s) (position, main tasks, name, education, seniority)	
Summary of interview	
	(to be continued on as many pages as necessary)

Appendix 3: Observation guide

The following observation form should be filled during the tour in the shop floor and the premises of the company. Before filling the score, please be sure that you have the exact understanding of the object being scored. Check with senior researcher and with shop floor manager in case of doubt. In the comment field, it is expected that the researcher give relevant details about the object being scored which help understand the level of scoring.

Observation form
(Selected production line/department)

Name of line/department	
Date of observation	
Participating site staff (position, main tasks, name, education, seniority)	
No of workers	
No of supervisors	
Production equipment	Number of workstations and machines
Main products	
Output/hour or day (Takt time)	

Scoring 1-5, NA (1=conditions poor/risks not controlled/low productivity/not existing, 3=conditions acceptable, risks controlled/productivity as expected, present at expected level, 5=conditions good, risks avoided at high level, productivity high, present at best level, NA=not applicable)

Item	**Score**	**Comment**
Machine risks (physical protection and behaviour)		
Chemical risks		
Vapours and dust		
Noise		
Housekeeping		
Lighting		
Layout (easy access, unnecessary movements and transport avoided)		
Heat		

Ventilation		
Floor marking of transport and production areas		
Smooth floor without holes		
Chairs with backrest and height adjustable		
Tables/machines in good height and adjustable		

Materials and tools within easy reach		
Equipment for heavy lifting and carrying (lifts, carts etc)		
Standard of machinery and equipment (age, maintenance)		
Standard of machinery and equipment (technology)		
Flow (line balancing, buffers, additional helpers)		
Kanban		
SOP		
Daily/weekly production performance displayed		
Quality defects displayed		
Accidents and incidents displayed with actions		
Kaizen boards		
OHS labels and posters		
Access to drinking water		
Toilets		

Possibilities for improvement of OHS and productivity (at least five possibilities)

Description of improvement	OHS, productivity or both	Requirements for implementation (cost, complexity, knowledge)

Appendix 4: OHS Maturity Level Assessment

Organizations vary in their understanding of the concept of OHS maturity, and the actions necessary to influence it in a positive way. Organizations may eventually evolve and develop this understanding. The five stages should not be considered as totally distinct. It is possible for an organization, at any one time, to exhibit characteristics associated with several, or all, of the stages. Based on the review of the safety literature, we have identified 12 organizational dimensions. The health and safety maturity level for each of these dimensions will define the aggregated OHS maturity level of the organization. The 12 dimensions are the following:

1. Leadership Commitment and Communication

Expectations

a) Individuals are not blamed for the accidents and other risks; rather the management believes that accidents and risks emerge through the interaction of systems and people.
b) Management takes responsibility for identifying the root causes of accidents and risks and eliminating them
c) Management is directly involved after an accident or worker experience of another OHS problem and show personal interest in the affected individuals and the investigation process.
d) Employees from all departments take accidents and exposure to others personally and seek ways for avoiding similar accidents in the future.
e) There is an open two-way channel of communication between employees and management.
f) The organization checks regularly the effectiveness of the communication with employees.
g) The company communicates to the employees all safety related issues regardless of severity or impact on production.

Evidence		Responsible
Data	The number of OHS programmes / Initiatives initiated and championed by top management / Number of health and safety projects initiated by employee suggestions	HR manager
Documentation	Descriptions of OHS improvement programmes (team composition, actions, outcomes) / Policy about dealing with employees involved in accident / Meeting minutes / memos of health and safety meetings where employees suggestions for health and safety improvement are noted and acted upon	HR manager
Informants	What do you do after an accident? What happens to the employees involved in severe accident? What kind of safety communication do you use? Normally and after an accident?	HR Manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Leadership Commitment and Communication				
Responsibility for accidents is seen as belonging to those directly involved. The priority is to limit the damage and get back to production. Management is not interested apart from telling workers not to cause problems.	The leadership sees OHS compliance as one of the goals of the business. The responsibility of the system for accidents is considered but has no consequences. The "flavor of the month" safety message is passed down from management. Any interest diminishes over time as things get "back to normal".	OHS compliance practices and goals are communicated in the organization. There is increase in awareness. However, there is consistent leadership follow up for implementation.	Management look at the whole system, including processes and procedures when considering accident causes. Investigation focuses on underlying causes and the results are fed back to the supervisory level. It is admitted that management must take some of the blame. Managers realize that dialogue with the workforce is desirable and so a two-way process is in place.	The responsibility of OHS compliance is distributed among all employees and managers. People take a broad view looking at the interaction of systems and people. There is a definite two-way process where management gets more information back than they provide.

2. Business Policy

Expectations

a) Workers and managers value the recognition as they consider good safety performance intrinsically motivating
b) Evaluation is based on outcomes and continuous improvement (process improvement).
c) Management and employees recognize that productivity and safety objectives can come into conflict.
d) Measures are in place to explore and identify synergies out of these conflicts (internally and with contractors/buyers) in an effective and transparent manner.

	Evidence	Responsible
Data		
Documentation	Policy, Memo or minutes of meetings outlining the decision process and actions related to safety investments / Safety Award programme description (who is awarded? What is the criteria for awards?)	HR manager
Informants	What types of investment in OHS has been done? What kind or recognition or rewards for safety do you have?	HR manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Business Policy				
Productivity is the only concern. Safety is seen as costing money, and the only priority is to avoid extra costs. Staying alive is reward enough. There are only punishments for failure.	Cost is important but OHS compliance is gaining importance. However, OHS effort and resources have focus on operational factors (not behavioral). The understanding that positive behavior can be rewarded has not yet arrived.	Company have communicated policies and rules for acceptable OHS compliance on both operations and behavioral aspects. However, the cost aspect is still dominant in relation to mid- and long term OHS issues.	The company is learning how to juggle the two objectives. The long term aspects of OHS compliance are present in top managers' practices. Good performance is considered in promotion reviews. Evaluation is process-based rather than on outcomes.	Management believes that safety makes money. The company is quite good at juggling the two, and accepts delays to get contractors up to standard in terms of safety and to achieve acceptable working standards for workers.

3. Relation with contractors

Expectations

a) The company does not lower OHS requirements in contracting services

b) The company postpones the job until satisfactory OHS conditions are met in the contracting partner.

	Evidence	Responsible
Data	The number of pre-qualified contractors / Total of contractors / Total of audits / Audits per contractor	HR manager
Documentation	Prequalification questionnaire for contractors / Training for contractors / Auditing process and resources/audits carried out and consequences taken	HR manager
Informants	Do you have contractors? What kind of prequalification OHS criteria you look at?	HR manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Relation with contractors				
Get the job done with minimum effort and expenses. The company only pays attention to safety issues in contracting companies after an accident.	Company has established some formal procedures and selection criteria for subcontractors. However, still very poor safety performance has consequences for choice of contractors.	Contractors meet pre-qualification requirements, based on questionnaires and statistics. However, Safety standards are lowered if no contractor meets requirements.	Safety issues are seen as partnership opportunities. Prequalification is on the basis of proof that there is a working safety management system in the contractor. Joint company-contractor safety efforts are observed and the company helps contractor with compliance and training.	No compromises to work healthy and safely. Find solutions together with contractors to improve the safety management system and to achieve expectations even if this means postponing the job until requirements are met.

4. Relation with buyers

Expectations

a) The company has contractual obligations that cover safety and social responsibility activities.

b) The company has long term relationship with its buyers based on partnership and regular auditing

	Evidence	**Responsible**
Data	The number of direct and indirect buyers / Duration of relationship / Percentage of total revenues or sales per buyer / Total of audits / Audits per buyer	General manager and HR manager
Documentation	Prequalification questionnaire of buyers / Training by buyers / Auditing process (auditing items, penalties, corrective actions, resources)	General manager and HR manager
Informants	Can you describe the relation with your main buyers?	General manager and HR manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Relation with buyers				
Price is the only decisive factor for the relationship between the company and its buyers. There are no contractual obligations	There are some contractual obligations to improve the basic work conditions and labor compliance. The company invests in improving the health and safety	There are contractual obligations and incentives to improve OHS compliance. The company meets buyers' prequalification requirements. Safety	Pre-qualification is on the basis of proof that there is a working safety management system in the company. Joint company-buyer safety efforts are observed	The company has long term relationship with most of its buyers based on a sustainable balance between safety and productivity. The buyers audit

to cover OHS compliance.	issues only if it risks attrition with its buyers.	standards are improved in order to attract buyers. However the focus is still on the short term compliance.	and the buyers help the company with training and compliance on short and long term OHS objectives.	smoothly and regularly the company and agree on safety improvement actions.

5. Objectives, Targets & Performance Measurement

Expectations:

a) Each site shall establish a measurable health and safety plan, quantifying corporate objectives and targets and site objectives and targets which shall be agreed by site personnel and corporate personnel.Objectives and targets shall be in line with the general target of enabling continual improvement of health and safety performance.

b) Objectives and targets shall be communicated and understood by all appropriate personnel, including the Executive, Senior Management, line management, employees and contractors.

c) Adequate resources shall be assigned to ensure that the planned and agreed targets and objectives are met.

d) Senior management shall be issued with Health and Safety Performance Indicators. Safety performance shall be part of those indicators to ensure that safety is a priority for management.

e) The company shall ensure that objectives and targets are reviewed on a periodic basis to ensure they stay on programme and to agree changes whqen they do not.

f) Targets and objectives shall be both reactive—accidents, incidents and dangerous occurrences—and proactive—near hits, etc. and where appropriate, performance measures including benchmarking against established best practice.

g) The organization and all sites will be responsible for the effective review of objectives, targets and performance indicators to ensure they remain relevant for the current safety risk.

Evidence		Responsible
Data	Number of safety indicators (proactive and reactive / outcomes and process indicators) / Trends and charts of safety indicators	HR manager / Production manager
Documentation	List of safety indicators and objectives / Owners of indicators / Process of monitoring and review	HR manager / Production manager
Informants	Do you have safety targets? What safety indicators and target do you have? Who is involved in establishing and improving safety targets?	HR manager / Production manager
Observation	Look for visual safety indicators in the workplace	Line supervisor

Reactive	Formal	Deployed	Autonomous	Way of life
Setting of Targets and monitoring				
Little evidence of safety related activities. There is some measurement effort after accidents or inspection. Formal safety goals and objectives have not been identified, let alone documented.	Safety goals are introduced and based around improving safety performance. There is a site plan established by the safety department that is passed around the senior management team, but not well communicated to the rest of the workforce.	Safety targets related to improving standards or systems are communicated to all departments, but actions for this mainly still apply to the safety department. All targets are determined by the Safety department and sanctioned by Senior Management. Monitoring is carried out by the Safety department who also becomes accountable for actions and activities related to the safety management system.	Safety monitoring and accountability is spread to all departments. Senior and Operations Managers are involved in determining safety objectives in conjunction with the Safety department. The safety performance indicators are proactive and reactive. Safety initiatives and activities are adequately resourced and action plans/objectives are set and monitored by senior managers.	Roles and activities are clearly defined for all levels in the site (managers and workers). Work teams independently establish their own work objectives. A performance monitoring system is in place focusing on operational excellence and continuous improvement.

6. Training

Expectations

a) Training needs are identified by management and workers
b) The methods for acquiring skills are defined and agreed upon between management and workers
c) Attitudes and behaviours towards health and safety are seen as important as acquiring skills and knowledge

Evidence		Responsible
Data	Number of trained employees and managers	HR manager
Documentation	Documentation for training (new employees, managers, safety professionals, office workers, shop floor workers)	HR manager
Informants	What are the safety trainings you have? What is the aim of these training modules? How you identify needs for training?	HR manager
Observation	Look at the quality and availability of health and safety training facilities and equipments	HR manager

Reactive	Formal	Deployed	Autonomous	Way of life
Training				
No training takes place unless it is compulsory by law. After an accident money is made available for specific training programmes. The training effort diminishes over time.	OHS Training needs are identified but are still more focused on technical skills and do not approach behavioral change. Employees are trained to increase knowledge about work risk and work accidents.	Competence matrices are present and lots of standard training courses are given. Acquired course knowledge is tested. There is some on-the-job transfer of training. There is increasing awareness that safety culture and attitudes are important but there is no focus on these dimensions.	Leadership fully acknowledges the importance of tested skills on the job. The workforce is proud to demonstrate their skills in on-the-job assessment. Culture and attitudes are becoming central issues in training.	Issues like culture and attitudes become as important as knowledge and skills. Development is seen as process rather than an event. Needs are identified and methods of acquiring skills are proposed by the workforce, who are an integral part of the process rather than just passive receivers.

7. Workforce Involvement

Expectations:

a) Employees from all departments and levels are engaged and interested in participating in safety-related issues.
b) Employees have a good understanding of the safety issues and of the on-going safety initiatives.
c) There is a running planning process integrating work, health and safety.
d) The planning focuses on both the anticipation of problems and review of the process.
e) Employees are trusted to do most planning.
f) Job safety analysis / Job safety observation techniques are revised regularly and accepted by the workforce as being in their own interest.
g) Workers and supervisors are not afraid to tell each other about hazards.
h) Everyone checks for hazards and Supervisors encourage work teams to check safety for themselves.
i) There is no problem with demanding shutdowns of operations.

	Evidence	**Responsible**
Data	Number of employees from each department engaged in safety initiatives (safety department, production, managers and workers)	HR manager/ Safety manager
Documentation	Committees with worker participation (actions and outcomes) / Description of OHS work planning and the review process / Participants in the planning and review / Policy for risk analysis (participants / impacts on operations/ implemented risks assessments / List of items checked and description of the process of daily checks / participants / impacts on operations)	HR manager/ Safety manager

Informants	What the safety on-going initiatives? Do you have OHS planning? Do you have safety committees? Do you have daily checks? How is it done?	HR manager/ Safety manager
Observation	Look at the software or other techniques used for risk analysis	HR manager/ Safety manager

Reactive	Formal	Deployed	Autonomous	Way of life
Workforce Involvement				
The employees do not engage in safety issues. The employees are invited to participate in safety-related issues only when serious accidents occur based on what went wrong in the past.	A group of selected employees, mainly related to safety department, are engaged and interested in safety-related issues. Site activities are regularly checked by the line management, but not on a daily basis. Inspections aim at compliance with procedures.	All Departments are involved in OHS projects and OHS improvement. However, the involvement is still at the managerial level. No direct involvement of shop floor workers achieved.	Employees from all departments and all levels are engaged and interested in safety-related issues. OHS Planning is standard practice with work and OHS integrated in the plan. Plans are followed through and there is some evaluation of effectiveness by supervisors and line management. Job safety analysis / Job safety observation techniques are accepted by the workforce as being in their own interest and they regard such methods as standard practice. Supervisors encourage work teams to check safety for themselves. Managers doing walk-rounds engage employees in dialogue about the importance of regular daily checks.	All employees are engaged in both safety-related and environmental issues. The majority of employees are interested in participating in health and safety-related issue. There is a polished OHS planning process with both anticipation of problems and review of the process. Employees are trusted to do most planning. There is less paper, and the process is well known and disseminated. Job safety analysis is revised regularly in a defined process. People (both workers and supervisors) are not afraid to tell each other about hazards. Everyone checks for hazards, looking out for themselves and their work-mates. Supervisor inspections are largely unnecessary. There is

				no problem with demanding shut-downs of operations.

8. OHS structure and accountability for OHS results

Expectations

a) Safety is seen as an important job, given to high fliers
b) Safety responsibilities and accountability are distributed throughout the company
c) Measurement against the plan shall form part of the site and corporate safety accountability process.

Evidence		Responsible
Data	Number and seniority of people in the safety department / Turnover of OHS employees	HR manager / Safety manager
Documentation	Description of OHS responsibility in the company / Policy or minutes describing the accountability of managers and workers for OHS results and control.	HR manager / Safety manager
Informants	What is the structure of safety? Who is responsible for following up on accident issues?	HR manager / Safety manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
OHS structure and accountability for OHS results				
If there is a OHS department, it consists of one person or a small staff in the HR department. There is no accountability as nothing has been set. The department is seen as a police force.	There is structure of OHS department based on the company strategy and priorities for improving OHS standards. However, The OHS department is held accountable alone for results.	OHS structure becomes a department with some status and power, mainly performing number crunching and sending people on training courses. Accountability is split between safety department and line management depending on the results.	Safety is seen as an important job, given to high fliers. Safety professionals are recruited directly and advisors are appreciated by the line. All senior people in operations must have Safety experience. Line managers and Supervisors are held accountable for results as they are able to detect and act proactively on health and safety issues.	There might not be a Safety department because it is not needed, as the safety culture is right. Safety responsibilities are distributed throughout the company. If there is a department it is small but powerful, having equal status with other departments. Every worker in the organization is ac-

				countable for specific risk control activities.

9. Accident Investigation

Expectations:

a) There is a formal process for reporting and investigating accidents
b) There are trained investigators to achieve a deep understanding of how and why the accidents happen
c) There is follow up procedure to check that change occurs and is maintained.

Evidence		Responsible
Data	Number of accidents investigated / Outcomes / Impacts	HR manager / Production manager
Documentation	Description of the process for investigation of accidents (responsible for investigation and maintenance)	HR manager / Production manager
Informants	Do you have investigation process? Can you describe the process? Outcomes and follow up?	HR manager / Production manager
Observation	Look at the implementation and outcomes	HR manager / Production manager

Reactive	Formal	Deployed	Autonomous	Way of life
Accident investigation				
Many incidents are not reported. Investigation only takes place after a serious accident. Analyses don't consider human factors or go beyond legal requirements. Protect the company and its profits.	There is a formal investigation process but it is not consistently followed. There reporting system and investigation often focuses at the immediate causes. There is little systematic follow up and previous similar events are not considered.	There is a systematic deployment of investigation process based on reports of accidents. However, the search for causes is usually restricted to the level of the local workforce.	There are trained investigators to check that change has occurred and been maintained. The search involves all companies' aspects and levels. Reports are sent company-wide to share information and lessons learned.	Investigation and analysis by a deep understanding of how accidents happen. The investigation process is well assimilated at all levels of the company. Real issues identified by aggregating information from a wide range of incidents. Follow-up is systematic, to check that change occurs and is maintained.

10. Unsafe Behaviors and Unsafe Work Conditions

Expectations:

a) Unsafe behaviors and unsafe and unhealthy work conditions are avoided and sufficiently controlled at shop-floor level
b) Unsafe behaviors and unsafe work conditions are timely and clearly reported
c) The reports are made available for all employees and are used in daily work to improve the safety

Evidence		Responsible
Data	Number and types of unsafe behaviors and unsafe work conditions / Severity	HR manager
Documentation	Description of the process of reporting and improvement	HR manager
Informants	What are the unsafe behaviors and unsafe work conditions? How do you report unsafe behavior and unsafe working conditions?	HR manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Unsafe Behaviors and Unsafe Work Conditions				
There is no process in place for reporting or acting on unsafe behaviors and unsafe work conditions.	There is a formal process to report and act on unsafe behaviors and unsafe work conditions, but it is often ignored. If Reporting exists, it often does not lead to action.	There process to report and act on unsafe behaviors and unsafe work conditions is known in the company. However, it is mainly used by safety department.	All employees are trained to report on unsafe behaviors and unsafe work conditions. Top management act and follow up on the report.	All levels report and act on unsafe behaviors and unsafe working conditions. Reporting process and use is continuously improved.

11. Legal requirements, Auditing and Reviews

Expectations:

a) Company have a full audit system running smoothly with follow up and improvement actions
b) Company interacts smoothly with the regulatory bodies and employs a full disclosure policy

Evidence		Responsible
Data	Number of critical and urgent issues in audit	HR manager
Documentation	Description of audit system / Latest regulatory assessment / Action plan	HR manager
Informants	Please describe the auditing process and types	HR manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Legal requirements / Auditing and reviews				
Accept being audited as inescapable, especially after serious or fatal accidents. No schedule for audits and reviews, as they are seen as punishment..	There is a regular, scheduled audit program. It concentrates on known high hazard areas. The auditing process is not able to identify the ceremonial practices and to make them more substantive.	There is regular audit program covering all aspects of OHS compliance. However, the results are more visible for some areas (like heat and ventilation) and less visible for areas such as worker health, ergonomics, and psychological stress.	Extensive audit program including cross-auditing within the organization. Results achieved in all areas of compliance.	Full audit system running smoothly with good follow up. Continuous informal search for non-obvious problems with outside help when needed. There are fewer audits of hardware and systems, and more at the level of behaviors.

12. Industrial relations, Welfare and Job Satisfaction

Expectations:

a) Company and employees communicates regularly about ways to increase Job satisfaction
b) Instruments such as collective bargaining (collective committee), social and financial support and benefits are all available

	Evidence	**Responsible**
Data	Number of employees using companies benefits / Type of benefits used	HR manager / Employees representatives
Documentation	Description of the benefits policy	HR manager / Employees representatives
Informants	What are the benefits you have? How is the satisfaction with the benefits? Participation committee effectiveness / Union role.	HR manager / Employees representatives
Observation	Look at the quality of the services (Medical Centre, Canteen, Childcare, Dormitories…)	HR manager / Employees representatives

Reactive	Formal	Deployed	Autonomous	Way of life
Industrial relations, Welfare and Job Satisfaction				
The company has no focus on Industrial relations or welfare as topics such as collective bargaining or social responsibility ac-	There is a participation committee but no union is allowed. The company has some basic welfare services. The participation committee is elected but has little	There is a participation committee but no union is allowed. The company has good welfare services. The participation committee is elected but	The company seeks to improve Job satisfaction by offering good welfare services to employees. The participation committee is effective in ensuring high	Employees and management regularly communicate about ways to increase safety and Job satisfaction. All instruments, bene-

tivities are unknown. Job satisfaction is very low and welfare services are given only after attrition with employees.	power on influencing OHS compliance.	has power on influencing low cost and highly visible OHS compliance.	compliance with OHS standards.	fits, and social services, are available and used effectively. Union and participation committee are present and engaged.

13. Scoring sheet

Item	Score	Reason for selecting score
OHS maturity assessment		
Leadership commitment and communication		
Business Policy		
Relation with contractors		
Relation with buyers		
Objectives, Targets & Performance Measurement		
Training		
Workforce Involvement		
OHS structure and accountability for OHS results		
Accident Investigation		
Unsafe Behaviors and Unsafe Work Conditions Reporting		
Legal requirements, Auditing and Reviews		
Industrial relations, Welfare and Job Satisfaction		

Scoring 1-5, NA (1=Pathological, 2=Reactive, 3=Calculative, 4=Proactive, 5=Generative, NA=not applicable)

Appendix 5: Productivity Maturity Level Assessment

The productivity maturity assessment addresses the following 11 organizational dimensions:

1. Leadership commitment

Expectations:

a) Managers routinely go to the spot of a problem in production to assess the actual situation and talk to production workers.
b) Managers are aware of the productivity initiatives and are directly involved in them
c) There are qualified and available human resources for the successful implementation of improvement projects

	Evidence	Responsible
Data	Number of full time dedicated employees or equivalent / Seniority level / Years of improvement experience / Number of managers experts in improvement	Production Manager
Documentation	Projects and improvement documentation	Production manager
Informants	What are the improvement initiatives? Who participate in the projects? Who is the driver of the projects?	Production manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Leadership alignment				
No leadership alignment for process improvements. Company executives demonstrate no understanding of the improvement approach.	Leadership is somewhat aligned with process improvements, but visible and active selection and review of projects are not in place. Some specialists are available to support projects. Executives demonstrate a basic understanding of the improvement approach.	Leadership aligned with process improvements, visible and active selection and review of projects. Specialists and selected employees are available to support projects. Leadership demonstrates an understanding for improvement strategy but do not have full faith.	Leadership is aligned with vital few metrics, visible selection and review of projects. Trained resources are available in all departments and units. Leadership demonstrates good understanding and has faith in improvement methodology. Leadership committed but not prepared for accelerated improvement.	Trained and committed resources supporting projects are available. Top management has full understanding and faith in improvement philosophy. Leadership prepared for accelerated improvement.

2. Employee involvement

Expectations:

a) There is a formal process in place to solicit ideas and suggestions for improvements from all employees and to recognize their participation. (E.g. suggestion systems, quality circles, incentive programs, etc.)

b) There is a formal process for production workers to regularly receive feedback on problems detected in downstream processes and at the customer.

c) There is a formal process in place that provides shop floor workers the opportunity to work in groups to address performance and quality issues.

d) Employees know the seven wastes, are actively involved in identifying waste in their processes, and are empowered to work to reduce or eliminate the waste.

e) Shop floor employees understand and can use common performance metrics to monitor and improve production processes.

f) Improvement projects are structured, planned, and time boxed; successes are recognized and expanded throughout the plant. (E.g. projects have champions responsible for implementation, action items have responsibility assigned, and implementation timing milestones are established.)

g) Many of the improvements made throughout the plant involve minor or no capital investment. (E.g., the improvement process is dominated more by small, incremental improvements than by large scale, capital intensive projects.)

h) Plant management communicates with shop floor workers regarding employee satisfaction and organizational objectives at least twice per year.

i) Employees are able to accurately describe the organizations goals and how their job contributes to the achievement of those goals.

Evidence	
Data	Number of improvement suggestions (Total / implemented/outcomes) / Number of employees participating in group projects
Documentation	Description of the employees suggestions program / Documentation of group projects/teamwork and participants
Informants	Do you have an improvement process? Who is involved in improvement?
Observation	

Reactive	Formal	Deployed	Autonomous	Way of life
Employee involvement				
Little or no involvement of people in process improvements	Involvement of selected people in process improvements to some extent. No systematic effort to involve people in improvement.	People form cross-functional teams whenever a problem arises. Processes for capturing employee	Quality improvement, problem solving and corrective action teams in place. 25 to 50% of employees involved in teams. People are	50% or more involved in teams; open access to top management; empowered to make improvement and

		suggestions and for giving feedback to employee are in place but not used regularly.	able to relate improvement projects to organizational goals. Processes for capturing employee suggestions and for giving feedback to employee are in place and running.	stop the process for quality.

3. Training

Expectations:

a) An ongoing education/training program has been developed for all employees, including new hires, transfers, and promotions.
b) Participation in relevant professional organizations is supported. Professional certification processes are supported.
c) The education and training needs of all employees are evaluated annually, and progress is reviewed quarterly.
d) Promotions, new hires, and transfers receive an initial education and training needs assessment and plan.
e) Education and training requirements are evaluated for all newly formed improvement teams.
f) All employees have received improvement education tailored to their job.
g) Key employees are pursuing, or have achieved certification through relevant professional organizations.
h) All employees are trained in basic problem solving skills.

	Evidence	**Responsible**
Data	Number of trained employees (shop floor / staff / Managers) / Number of hours training by employee	HR manager / Production manager
Documentation	Description of type of training available (basic, specialists, technical, behavioral)	HR manager / Production manage
Informants	What types of improvement training do you have? How do you identify the need for improvement training?	HR manager / Production manage
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Training				
No formal training on improvement or quality improve-	Selected team members have been trained. Some employees are trained	Lean training is deployed across the organization. Team members are trained	Team members have good understanding of lean and process	Lean/improvement is integrated in core operations and lean

ment tools, methodologies or even concepts. Each employee uses its own skills and experiences for problem solving.	on basic lean tools and facilitators are available.	on different tools according to needs (5S, Lean flow, Pull, Value stream, Visual management…)	improvement methodologies. Employees have both technical and behavioral skills to implement lean and improvement projects.	experts are frequently spotted among employees.

4. Continuous improvement

Expectations:

a) Kaizen meetings and events are in continuous operations

b) Managers and workers initiates improvements of all tasks they are involved in and pose suggestions to colleagues whenever improvement ideas and possibilities appear

c) A standardized operating procedure (SOP) has been developed to support continuous improvement and is used to train operators for each production process.

d) Operators can stop the line when a defective unit/part is found or when they cannot complete their process according to the SOP.

e) Error proofing devices and methods has been implemented to eliminate the top production defects for each work area.

f) Every production process has the SOP posted within view of the worker performing the process.

g) Organization uses intensively problem solving tools for continuous improvement

h) External and internal customers' concepts are understood and tied to continuous improvement methods.

Evidence		Responsible
Data	Data showing number and type of errors / trends in errors / number of SOP	Production manager
Documentation	Description of problem solving methods based on use of data and performance indicators	Production manager
Informants	Explain how you measure errors and improve the process. Do you have SOP? How is SOP used? Who is involved in continuous improvement?	Production manager
Observation	Look for SOP at the production line / Look for error proofing devices in the production line. Look for implemented improvements	Production manager

Reactive	Formal	Deployed	Autonomous	Way of life
Total Quality Focus				
Errors are inspected and cost of scrap and rework is accepted. Deal with customer complaints individually. No understanding of the connection between Continuous Improvement and work standards. Insufficient data available for key processes needing improvement and no formalized improvement methods exist.	Although errors happen but some initial thoughts prevail to implement or improvement systems using lean/improvement methods. Organization use data driven problem solving methods but data collection processes are not systematic and in place. Improvements usually come from management, engineering, supervision or when a customer complaint is received. Some standard work procedures exist to show how the process functions but are neither current nor displayed.	Organization uses data driven problem solving methods. Data collection is systematic, although not done extensively. Some improvement methodology evident. All standard work procedures can be seen in most areas. Process owners know the what, when, where, why and how of their areas. Ownership taken to use standards and keep them current.	Data driven continuous improvement is done extensively and efficiently, and people know the tools needed to advance the continuous improvement in the company. All associates trained. Open documentation and dashboards used to track improvements. Standard work procedures are current and posted in appropriate areas.	Zero-defect quality; organization uses data driven problem solving methods across the spectrum. Continuous Improvement is part of company culture mindset with little interference from management. Employees have quick and free access to all standard work.

5. Value stream mapping

Expectations:

a) The core processes of the business are mapped and known to all the employees
b) The main characteristics of each value stream are known (bottlenecks, improvement opportunities, critical points)
c) Link between value stream mapping and continuous improvement established.

Evidence		Responsible
Data	Number of mapped value steam processes / outcomes	Production manager
Documenta-tion	Maps and description of value stream processes	Production manager
Informants	Do you use value stream mapping? How do you use VSM?	Production manager
Observation	Look for the maps of value stream processes	Production manager

Reactive	Formal	Deployed	Autonomous	Way of life
Value stream mapping				
No process is mapped according to the value stream.	An understanding of VSM has been achieved. Some attempts have been made to map some of the processes.	A number of people have been trained in VSM, critical processes mapped. No improvements yet.	Most understand value of VSM. Mapping has uncovered opportunities for improvement. Action plans are in place. Rapid improvement blitzes proceeded by VSM.	Most processes mapped with results of action plans recorded. Continuous improvement is connected to value stream mapping and organizational objectives.

6. Control through Visibility

Expectations:

a) Updated display boards containing daily targets and outputs, job training, safety, operating measures, production data, quality problems and root cause analysis are readily visible throughout the plant.

b) Check-sheets describing and tracking the top defects are posted and up to date at each workstation. (E.g., each operator is aware of the key quality points and defect history of the process they are doing.)

c) There is good, effective communication between production shifts in the plant. (E.g. equipment, quality problems, production schedules, etc. are communicated daily, and production areas are left "ready to go" by the previous shift.)

d) Processes are equipped with call lights or signals that workers or machines can call for assistance when a problem is encountered.

e) Marked squares on the floor or other signaling devices are used to aid and activate production.

Evidence		Responsible
Data	Number of techniques/ Number of units using visual management techniques	Production manager
Documenta-tion	Description of the objectives and implementation of visual management tools	Production manager
Informants	Do you use visual management? What tools of visual management? How do you use the tools? What are the benefits?	Production manager
Observation	Look for visual instruments in the shop floor and offices	Production manager

Reactive	Formal	Deployed	Autonomous	Way of life
Control through visibility				
No visual management in place.	Visual management tools and techniques are introduced to the business. The adoption of the visual management techniques varies in intensity and frequency among departments. The techniques still not used effectively in practice.	Different visual management techniques are known to all the areas and departments of the organizations (Goal-setting and performance tracking, scheduling and production control, call lights, marked squares, idea sharing and team communication, report kaizen results and awards)	Organization uses visual management tools in order to meet emerging needs and objectives. However, management is still directly involved in the deployment of the Visual management techniques.	Visual management tools and culture are established and used in daily practice across the organization with almost no intervention from management. Visual management is connected to continuous improvement.

7. Accounting support to Productivity

Expectations

a) Accounting and financial measures that strategically encourage lean/improvement activities are used to proactively drive and then measure business progress and performance.
b) The accounting system enables a balanced set of financial and non-financial measures to assist decision-making and forecasting.
c) The financial system has been overhauled to ensure fast and efficient processing of information as required and is accessible to users as needed.
d) Work breakdown structure allowing consistent and timely capture of business costs and the reporting of financial benefits achieved by improvements.

Evidence		Responsible
Data	Accounting data supporting lean/improvement activities	Production manager
Documentation		
Informants	Do you use accounting information for improvement?	Production manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Accounting support to Productivity				
Accounting system provides basic financial data based on cost accounting. There is little awareness of accounting's role in supporting lean/improvement initiatives	There is awareness that accounting has a role in lean/improvement. Some staff has been trained and initial analysis has been undertaken.	Staff has been trained to connect lean/improvement to accounting. Pilot project has begun; departments measuring and targeting waste in its processes.	Key value streams are using lean/improvement accounting data. Decisions are being made using lean/improvement financial data. Current cost and revenue methods are being reviewed to accommodate lean projects.	Accounting system provides financial data based on measurements at the value stream level and provide support for lean/improvement. Accounting aligned with lean improvements: goals and outcomes.

8. 5S/Housekeeping

Expectations:

a) The plant is generally clear of all unnecessary materials or scrap and isles are clear of obstructions.
b) Lines on the floor clearly distinguish work areas, paths, and material handling isles. Signs clearly identify production, inventory staging, and material drop areas.
c) A daily checklist exists in each work center that identifies housekeeping activities to be performed.
d) There is "a place for everything and everything in its place:" every container; tool and part rack is clearly labeled and easily accessible to the user. People using tools, parts, fixtures, quality gages, etc. know where to find them.
e) A radar chart/spider diagram chart displays each area's workplace organization performance.

Evidence		Responsible
Data	Number of areas with 5S implemented and status of implementation	HR manager
Documentation	Description of 5S project	HR manager
Informants	Do you use 5S? What are the status and the challenges of 5S?	HR manager
Observation	Look at the 5S status on the shop floor and staff offices	HR manager

Reactive	Formal	Deployed	Autonomous	Way of life
5S/housekeeping				
Disruptive and messy, no formal workplace organization standard in place. No order,	Company aware of 5S principles but no training underway. Non-routine cleaning takes place.	Most areas have begun 5S. Materials have permanent positions, cleaning schedule followed.	Audit teams assess 5S standards. Teams investigate root causes of disorder. All areas working on	Clean, orderly, self-maintained; always "tour ready" without management interference.

area untidy, materials have multiple locations		Employees participate, support, understand and do most cleaning	standardizing 5S processes.	

9. Preventive maintenance

Expectations:

a) Maintenance team managers and workers have been trained in the basics of TPM.
b) Machines have all safety guard devices operative, and are locked out immediately when broken down. (E.g., safety guards are not disabled or removed. Malfunctioning equipment is not allowed to continue operating in production.)
c) Preventive maintenance activity lists are posted in work areas and item completions are tracked over time.
d) Preventive maintenance activities are focused on increasing utilization and minimizing cycle time variation. (E.g. capacity utilization is tracked and cycle time performance is monitored for each machine and issued in maintenance activity planning. The maintenance team is evolving from preventive to predictive abilities.)
e) Preventive maintenance responsibilities are defined for both maintenance and production workers. (E.g. operators are doing routing tasks like checking oil, cleaning machines, & changing tools.)
f) Maintenance is scheduled as part of the overall production plan.

	Evidence	**Responsible**
Data	Number of employees trained in preventive management/data used for preventive maintenance	Production manager
Documentation	Preventive maintenance policy	Production manager
Informants	Do you have preventive maintenance? How it works? Who does the preventive maintenance?	Production manager
Observation	Look at the preventive maintenance schedules and devices at the shop floor	Production manager

Reactive	Formal	Deployed	Autonomous	Way of life
Preventive maintenance				
Reactive or breakdown maintenance is widely used. Employees have no responsibility for equipment. Capacity assumed to be available by contracting out to third	Planned maintenance is applied by specialists in line with process needs. Key equipment current capacity reg-	Data captured used to plan maintenance. Employees inform maintenance of possible problems. Employees contrib-	Employees proactively maintain equipment and process conformance using a formal maintenance management process (such as	Preventive maintenance is spread across the supply chain (involving suppliers) in order to maintain process conformance. Plans recognize capacity issues and include

parties or buying additional equipment.	ister in place, including third party suppliers.	ute towards process conformance. Project plans or factory or project scheduling in place to objectively manage availability or performance of equipment.	TPM). Maintenance called in only when problems are outside operator capability.	contingency to manage risk and train workers.

10. Structured Flow/Pull Manufacturing

Expectations:

a) Part travel distances have been analyzed and reduced by moving equipment and workstations closer together. (E.g. wasteful material conveyance has been eliminated by reducing the distance between processes, work cells, process groups, or material staging areas.)

b) Subassembly or production areas that supply a main production line or cell(s) do not change-over early to build inventory buffers, etc. (E.g. changeovers are synchronized across related production processes.)

c) Defective items are immediately detected when they occur in the production process. (E.g. very seldom does a bad part make it to a downstream process or to the customer with a lot of suspect parts in between requiring additional inspection.)

d) Processes and equipment are arranged to facilitate a continuous flow of work through production and not arranged in machinery or process groups. (E.g. WIP inventory does not accumulate after processes. Machines or equipment groups do not bottle-neck the material flow, etc.)

e) U-turn layouts and U-shaped cells have been implemented on the shop floor to enable one-piece (continuous) flow of material through production.

f) There is an effort to level production schedules by spreading the monthly purchase volume evenly over the period. (E.g. the daily production volume for a part does not vary substantially from one day to the next based on daily release quantities,)

g) The takt time is used as the basis to determine process cycle times and allocate work throughout the production process. (E.g., production processes are designed with cycle times that does not exceed the takt time.)

h) Material flow or movement in the plant is dependent on individual pull signals (via Kanban, etc.) from downstream workstations as parts or materials are consumed.

i) Production supervisors are not motivated to produce more parts than the subsequent processes require. (E.g. supervisors are not motivated to “build to make the numbers” regardless of downstream process requirement.)

Evidence		Responsible
Data	Data about Takt time (= Production time available / Customer volume) / inventory level	Production manager
Documentation		
Informants	Do you use flow or takt-time concepts? Do you use U shape or other shapes?	Production manager
Observation	Look at the production line for inventories/Kanban/flow/U-shape/Cells/Pull	Production manager

Reactive	Formal	Deployed	Autonomous	Way of life
Structured Flow Manufacturing				
Flow between processes is disjointed. Push scheduling commonly utilized with little integration with customer/supplier processes.	A few key processes are aligned for flow and stability improved to reduce inventory/buffer levels. Individual activity processes are partially adapted to suit flow.	Key processes within value streams are ordered to enhance flow and reduce inventory/buffer levels.	Majority of internal and a few external processes are adapted to enhance value stream flow and minimize distance travelled, inventory/ buffer levels or time delay. Processes are stable throughout the internal and external value stream. Pull scheduling is utilized throughout the organization.	Process flow throughout all value streams (internal and through the supply chain) is continuous, in time with actual demand, with distance travelled and inventory/ buffer levels minimized. Information is always available to enable decision-making when required to enhance flow. Processes are fully adapted and integrated to optimize flow.

11. Suppliers and customers' relationships

Expectations:

a) Suppliers and customers have early involvement in the design process for new products.
b) Suppliers and customers are at least quarterly provided feedback on delivery, quality and service.
c) The supplier and customer are actively engaged in initiatives regarding the non-price areas of cost.
d) Suppliers deliver materials to point of use.
e) There are specific goals/objectives for the supply base for total dollars spent to be at point of use, supplier managed inventory and consignment.
f) On-time performance from the supply base is at least 95% on time to the due date.
g) The company consistently provides technical expertise to supply partners to activate their lean/improvement efforts.
h) Long term agreements exist for at least 80% of total purchase dollars.

Evidence		Responsible
Data	Performance Indicators with suppliers and customers	General manager / Production manager
Documentation		
Informants	What type of cooperation for production improvement do you have with your suppliers/customers? Are there sharing of experiences and risks?	General manager / Production manager
Observation		

Reactive	Formal	Deployed	Autonomous	Way of life
Customers and Suppliers relationships				
Suppliers and customers relationship is strictly based on short term financial results	Feedback is given to companies about improvement indicators. Companies are encouraged to improve quality. Customers contracts and compliance reports in place	There is a management system in place between the organization and its suppliers/customers for quality and cycle-time improvement. The use of the system is restricted to critical processes.	The organization and its suppliers and customers have a well-functioning management system covering all aspects of relationship (Quality, cycle time, new customers' requirements).	The organization operates in long term partnership with it suppliers and customers. Benefits of improvement and experiences are shared between the two parties including long-term objectives.

12. Scoring sheet

Item	Score	Reason for selecting score
Productivity (Lean) maturity assessment		
Leadership commitment		
Employee involvement		
Training		
Continuous improvement		
Value stream mapping		
Control through Visibility		
Accounting support to Productivity		
5S/housekeeping		
Preventive maintenance		
Structured Flow/Pull Manufacturing		
Customers and Suppliers relationships		

Scoring 1-5, NA (1=Reactive, 2=Formal, 3=conditions, 4=Autonomous, 5=Way of life, NA=not applicable)

Appendix 6: Template for company report

The final report for each company should contain the following items:

1. Title

The title should contain the following information:

POSH-BD
Baseline Study Report Nr. XX
Company name XXX

2. Data collection

2.1. Participating researchers
2.2. Dates for data collection (all contacts)
2.3. Circumstances, constraints, availability of interview persons, quantitative data, documents

3. Description of company

3.1. Mother company

3.1.1. A narrative about history and situation of the company, including the following:
3.1.2. Foundation, ownership, historical development
3.1.3. Main product, suppliers, markets, costumers
3.1.4. Economic situation (yearly turnover, profit, investment)
3.1.5. Expectations and plans for the future

3.2. The production site

3.2.1. Description (location, size, production, history)
3.2.2. Structure (department, management)
3.2.3. Main equipment and machinery
3.2.4. Main products and costumers
3.2.5. Human resources management (salaries, working hours, overtime, skills, training, industrial relations)
3.2.6. Expectations and plans for the future

3.3. The selected production line

3.3.1. Description of production, main products, main equipment
3.3.2. No of workers and supervisors

4. Productivity

4.1. Quality management

4.1.1. Description of the quality management system (incl. figures on quality defects, remakes, cost)

4.2. Production management

4.2.1. Description of the production and management system, changes in production such as change of product (incl. figures on production)
4.2.2. Lean and productivity
4.2.3. Description of procedures and systems for productivity improvements

4.2.4. Productivity improvement practices (incl. data on improvement initiatives, kaizen, outcomes of initiatives

4.3.Productivity maturity score

4.3.1. Indication of score and reasons for choosing this score (including sub-dimensions)

5. Health and safety

5.1.HS management

5.1.1. Description of management system, structure, activities, committees

5.2.OHS performance

5.2.1. Risk assessment procedures and practices

5.2.2. Registration of accidents, rates and follow up on accidents

5.2.3. Training and worker involvement

5.3.OHS maturity score

5.3.1. Indication of score and reasons for choosing this score (including sub-dimensions)

6. Discussion and conclusion

6.1.Strength and weaknesses of production

6.1.1.1.Discuss the main points regarding strengths and weaknesses of production

6.2.Strength and weaknesses of health and safety

6.2.1.1.Discuss the main points regarding strengths and weaknesses of health and safety

6.3.Possibilities for integration of productivity and OHS

6.3.1.1.Discuss with concrete examples how productivity and OHS can be integrated in practice

7. Appendices

7.1.Form with Company information

7.2.Form with production site information (incl. selected production line)

7.3.Sheets with summaries of interviews

7.4.Observation form incl. possibilities for improvement

7.5.Score sheet for productivity

7.6.Score sheet for OHS

Appendix 7: Procedure for uploading data

1. Dropbox
   In Dropbox, the company reports and data are saved under the groups that generated them (Group A: 17 reports / Group B: 16 reports / Group C: 17 reports)
2. Access and security of confidential information
   Malek is responsible for uploading and maintaining the data related to reports on Dropbox

Appendix 8: Checklist and manual for quality control

The Procedure and checklist for quality control of baseline company reports should be done according to the following instructions:

1. The responsible researcher (senior researcher or Ph.D. student) prepares the report supported by the research assistant.
2. Both the responsible researcher and the research assistant fill out the scoring sheets independently of each other. Scores are compared and in case of differences reasons for the different scores are assessed and the two persons seek to find a shared scored. If in doubt or disagreement a senior researcher is consulted.
3. The draft report is submitted to a senior researcher who has not been involved in writing the report.
4. The senior researcher checks the presence of all required documents and the quality of the reports by filling the checklist below. The name and date of completing the quality control is indicated at the front page of the report, and the filled checklist is attached as an appendix to the report.
5. In case of missing data, the reasons and the attempts to secure the data are explained in details.

The following table contains the checklist of items for quality control of baseline company reports.

Name of senior researcher			
Date of quality control			
	OK	Changes required	Comments
The data sampling has been carried out as required and all data collected			
The report template has followed			
The text and the assessments have the required quality			
Basic company data complete			
Minutes of interviews complete with questions and answers			
Score sheet for observation of production line complete			
Score sheet for productivity maturity incl. reasons for scoring complete			

Score sheet for productivity maturity incl. reasons for scoring complete					
Quantitative data keyed in to spreadsheet complete					
	No	Yes	Explain why		
Any data missing					

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